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## (54) A system for establishing a communication path in a closely coupled computer system.

(57) In a system for establishing a communication path between one global server (13) and a plurality of local servers (14,14') and transmitting a request for processing a message through the communication path in a closely coupled computer system (10), the establishing system includes: a first capability (C-CAP) which is issued from the global server (13) or the local server (14,14') to an arbitrary client to receive the request transmitted from the arbitrary client; a second capability (R-CAP) which is issued from the global server (13) or local server (14,14') to a specified server to establish the communication path ensuring security of the message from the specified server; a message communication unit (12) for transmitting the message between the global server (13) and the local server (14,14') by using the first and second capability (C-CAP,R-CAP); and a destination intermediation unit (11) for registering the first capability (C-CAP) and informing the first capability to the local server (14) to intermediate the communication between the global server (13) and the local server (14); wherein the global server (13) requests the registration of the first capability (C-CAP) from the destination intermediation unit (11), the local server (14,14') acquires the first capability (C-CAP) from the destination intermediation unit (11), and the local server (14,14') requests the establishment of the communication path (12) from the local server (14,14') to the global server (13) by using the second capability (R-CAP).

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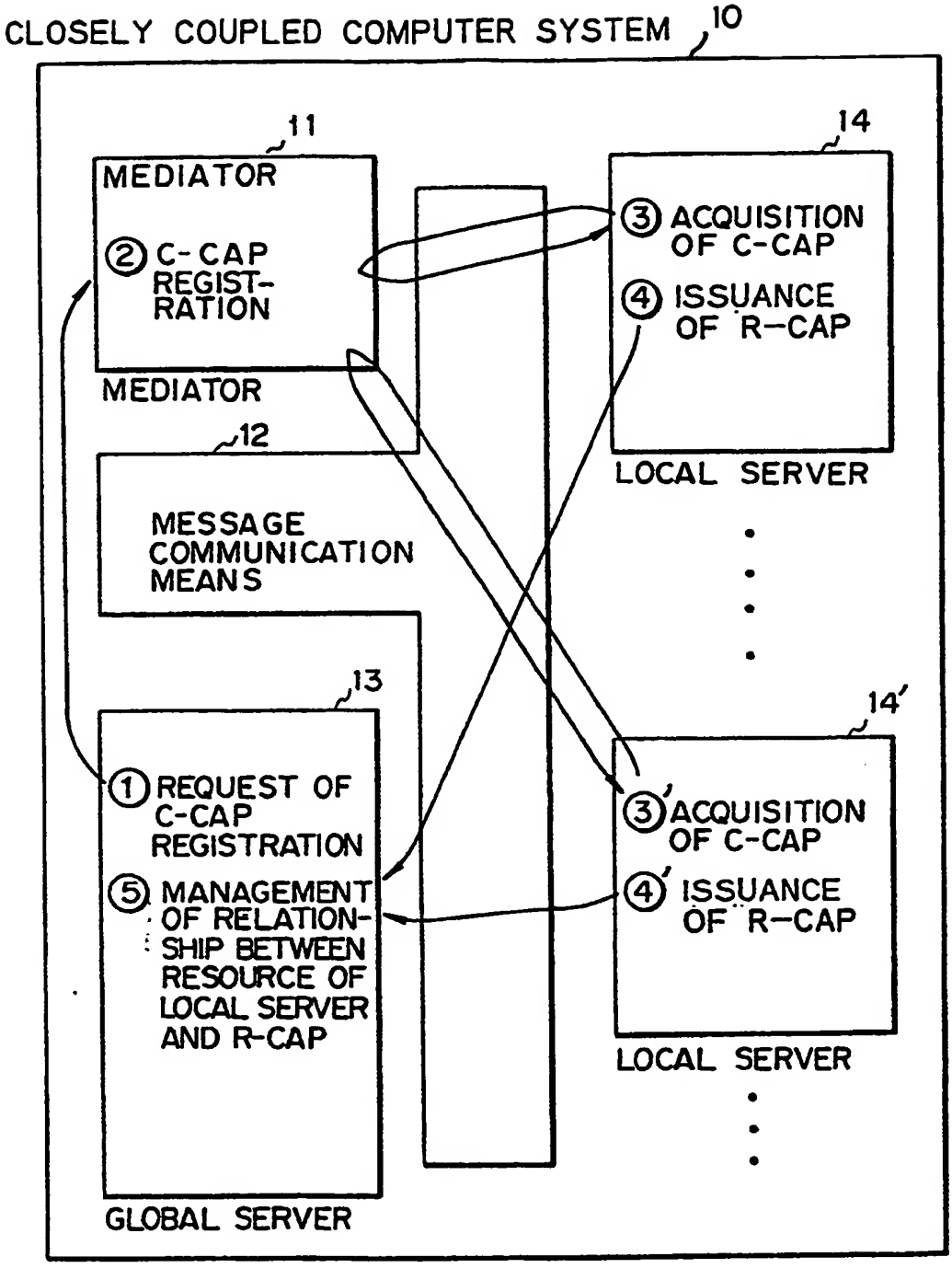
Fig. 1


CLOSELY COUPLED COMPUTER SYSTEM
10
11
MEDIATOR
② C-CAP REGIST-RATION
MEDIATOR
12
MESSAGE COMMUNICATION MEANS
13
① REQUEST OF C-CAP REGISTRATION
⑤ MANAGEMENT OF RELATION-SHIP BETWEEN RESOURCE OF LOCAL SERVER AND R-CAP
GLOBAL SERVER
14
③ ACQUISITION OF C-CAP
④ ISSUANCE OF R-CAP
LOCAL SERVER
14'
③' ACQUISITION OF C-CAP
④' ISSUANCE OF R-CAP
LOCAL SERVER

# A SYSTEM FOR ESTABLISHING A COMMUNICATION PATH IN A CLOSELY COUPLED COMPUTER SYSTEM

The present invention relates to a system for establishing a communication path between servers in a closely coupled computer system. More particularly, the communication path is established between a global server and a plurality of local servers, and a message communication between servers is performed based on an access by "capability". In general, the server is defined as "any one of processors taking charge of processing", that is, the server is defined as an apparatus for providing various resources, for example, a file, a printer, a communication network and the like in a computer system. Further, the capability is defined as a kind of a "ticket" or "access right" for servers in the message communication between servers.

A closely coupled computer system is constituted by a plurality of sub-systems each of which has a plurality of processors. In the sub-system, the number of processor can be enlarged in accordance with user requirements. In the closely coupled computer system, only one global server is provided in the system, and a local server is provided for every sub-system. Accordingly, one global server and a plurality of local servers are provided in the closely coupled computer system, and a request to use a resource is transmitted between the global server and a local server.

In the closely coupled computer system, the global server and the local servers are independently (asynchronously) started up after an initial program load (IPL) operation in the computer system is completed. Accordingly, in a message communication between servers, it is necessary to confirm the start-up state of both servers, and after confirmation, it is necessary to establish a communication path between servers. In a conventional art, a request for confirming start-up is transmitted from the global server to the local server. That is, the global server takes the initiative in the message communication between servers. Accordingly, it is necessary for the global server to always check the start-up state of all local servers, and the global server must recognize subsequent matters to manage the start-up state of all local servers.

First, the global server must get definition data for the local server, and must recognize the location where the local server exists. Second, the global server must recognize the start-up state of the local server. Accordingly, there are demerits in above conventional art as explained below. First, when the definition data for the local server is changed, it is necessary for the global server to perform a restart-up operation for all servers. Second, since the communication path between servers is fixedly established, it is necessary to previously define an order of the message communication between local servers. Second, when any one of the local servers is not started up, the global server must periodically check the start-up state of that local server.

In accordance with the present invention, there is provided a system for establishing a communication path between one global server and a plurality of local server and transmitting a request for processing a message through the communication path in a closely coupled computer system, the establishing system including; a first capability which is issued from the global server or the local server to an arbitrary client to receive a request transmitted from the arbitrary client; a second capability which is issued from the global server or local server to a specified server to establish the communication path ensuring security of the message from the specified server; a message communication unit for transmitting the message between the global server and the local server by using the first and second capability; and a destination intermediation unit for registering the first capability and informing the first capability of the local server to intermediate the communication between the global server and the local server; wherein the global server requests the registration of the first capability from the destination intermediation unit, the local server acquires the first capability from the destination intermediation unit, and the local server requests the establishment of the communication path from the local server to the global server by using the second capability.

Particular embodiments of the present invention will now be described with reference to the accompanying drawings; in which:-

In the drawings:

Fig. 1 is a basic block diagram for explaining a first aspect of the present invention;

Fig. 2 is a flowchart for explaining an initialization step of the global server;

Fig. 3 is a flowchart for explaining further processing steps of the global server;

Fig. 4 is a flowchart for explaining an initialization step of the local server;

Fig. 5 is a schematic block diagram of a closely coupled computer system applying the present invention;

Fig. 6 is a view for explaining an establishment method of a communication path according to the present invention;

Fig. 7 is a view for explaining a detailed method of establishing the communication path shown in Fig. 6;

Fig. 8 is a basic block diagram for explaining a second aspect of the present invention;

Fig. 9 is a view for explaining an operation of the communication according to the second aspect of the present invention;

Fig. 10 is a view for explaining a R-CAP management table in the reception server according to the present invention;

Fig. 11 is a flowchart for explaining the registration in the R-CAP management table shown in Fig. 10; and

Fig. 12 is a flowchart for explaining the search step in the R-CAP management table shown in Fig. 10.

Figure 1 is a basic block diagram for explaining the first aspect of the present invention. In Fig. 1, reference number 10 denotes a closely coupled computer system constituted by a plurality of processor modules, 11 a destination intermediation means (below, a mediator), and 12 a message communication means for processing a message communication by using the capability as the destination. Further, 13 denotes a global server, and 14 and 14' denote local servers.

In the first aspect of the present invention, two kinds of capabilities are provided for the message communication between servers. That is, the first capability is called a "calling capability" and the second capability is called a "resource capability". The calling capability (below, C-CAP) is issued by the server (in Fig. 1, the C-CAP is issued from the global server 13) for receiving a request transmitted from an arbitrary client. In this case, the client is defined as a subject which requests the processing of the resource. The server can establish the communication path to an unspecified client existing in an arbitrary location in the system. This establishment of the communication path is performed by opening the C-CAP to the public.

The resource capability (below, R-CAP) is issued from the server (in Fig. 1, the R-CAP is issued from the local server 14 or 14') to a specified client (in Fig. 1, to the global server 13). The R-CAP can ensure the security of the message to the specified client in the communication path.

In Fig. 1, numbers 1 to 5 are basic steps for establishing the communication path from the local server to the global server.

In step 1, after initialization of the global server itself is completed, the global server 13 requests registration of the C-CAP to the mediator 11 to start the reception of the processing request from the local server.

In step 2, the mediator 11 checks whether or not the request from the global server 13 is suitable for the registration of the C-CAP. When the request from the global server 13 is suitable, the mediator 11 registers the C-CAP from the global server 13 therein.

In steps 3 and 3', after initialization of the local server itself is completed, the local server 14, 14' issues the requests for acquiring the C-CAP of the global server 13 to the mediator 11, and for establishing the communication path to the global server 13.

In steps 4 and 4', the local server 14, 14' issues the R-CAP to the global server 13 to establish the message communication. The destination of the issuance of the R-CAP is determined based on the C-CAP of the global server 13 already acquired by the local server.

In step 5, after the global server receives the R-CAP, the global server 13 checks whether or not the local server has an authorization. If the local server has authorization, the global server 13 manages the relationship between the R-CAP and the resource of the local server.

As is obvious from the above steps, the mediator 11 has a function of intermediating the destination between the global server and the local server. The communication paths from the global server to the mediator 11 and from local servers to the mediator 11 are fixedly determined in the message communication means. Accordingly, it is possible for the server to communicate with the mediator 11 whenever the server is started up. Further, it is possible to access the C-CAP registered in the mediator 11 from any local server. Accordingly, in the present invention, the global server 13 receives the information of completion of start-up from the local server 14, 14', so that it is possible to manage the resource of the local server without fixed definition data for the local server.

In this case, since it is possible for the global server to establish the communication path whenever the global server receives the information of completion of start-up from the local server, it is not necessary for the global server to periodically check the start-up state of the local server and it is not necessary for the global server to take the initiative in the message communication between servers.

Figure 2 is a flowchart for explaining the initialization step of the global server. As shown step 1, a mailbox and control table are prepared in the initialization step of the global server, and as shown in step 2, the global server requests the registration of the C-CAP from the mediator 11.

Figure 3 is a flowchart for explaining further processing steps of the global server. This flowchart explains the steps for establishing the communication from the global server to the local server.

In step 1, the global server receives a message from each of local servers. In step 2, the global server analyzes the messages and checks whether or not the transmitter of each of the messages (i.e., local server) has authorized power. When the transmitter of a message is authorized, the global server obtains the R-CAP and the location of the local server by analyzing the message. In step 3, the global server acquires an area of control data, and manages the relationship between the R-CAP and the location.

Figure 4 is a flowchart for explaining initialization steps of the local server. As shown step 1, a mailbox, a control table, and an R-CAP are prepared in the initialization step of the local server. Further, as shown in step 2, to establish the communication path, the local server acquires the C-CAP of the global server from the mediator, and informs the R-CAP to the global server.

Figure 5 is a schematic block diagram of the closely coupled computer system applying the present invention. In Fig. 5, FCMP denotes a flexibly coupled multiprocessor, GCMP a global coupled multiprocessor, and SCCH a system communication channel. Further, reference number 20 denotes a processor having an instruction execution function.

As shown in the drawing, the FCMP is constituted by a plurality of GCMPs, and each of the GCMPs is interconnected by the SCCH which is duplexed. Further, the GCMPs are constituted by a plurality of processors. In this case, the number of processor can be enlarged in accordance with user requirements.

Any one of the processors in the FCMP can take charge of the global server 13 shown in Fig. 1, and any one of the processors in the GCMP can take charge of the local server 14, 14' shown in Fig. 1.

Figure 6 is a view for explaining a method of establishing the communication path according to an embodiment of the present invention. In Fig. 6, the same reference numbers as used in Fig. 1 are attached to the same components in this drawing. Reference number 50 denotes a client, i.e., a subject requesting the processing of a resource. The reference number 51 denotes management means for managing a capability. As shown in the drawing, the management means 51 is provided for the mediator 11, the global server 13, the local server 14, and the client 50.

In Fig. 6, numbers 1 to 8 are basic steps for the processing of a message according to the present invention.

In step 1, after initialization of the global server 13 itself is completed, the global server 13 requests the registration of the C-CAP from the mediator 11. In this case, the C-CAP is used as a destination for the message.

In step 2, the mediator 11 checks whether or not the C-CAP requested from the global server 13 is suitable based on the name of the server and an attribute requested from the server. If the C-CAP is suitable, the C-CAP is registered in the mediator 11. In this case, the attribute is informed to the mediator 11 with the request of the registration of the C-CAP through the message communication means 12.

In step 3, after the local server 14 is started up, it transmits the request to the mediator 11 to establish the communication path to the global server 13, and acquires the C-CAP of the global server 13. Previously, the global server is provided with a specified identification (ID) to specify its own server, and this ID is managed by the mediator 11. Accordingly, the local server utilizes this ID to acquire the C-CAP of the global server 13.

In step 4, the local server 14 issues the R-CAP to the global server 13. In this case, the destination of the R-CAP is given from the C-CAP of the global server 13. The R-CAP is utilized for the message communication hereinafter. Further, the local server 14 manages a volume and informs the name of the volume to the global server 13. The "volume" is defined as a management unit of data stored in a file.

In step 5, the global server 13 checks the attribute of the local server 14 which transmits the R-CAP, and manages the relationship between the R-CAP and the volume name after confirmation of the attribute. After these steps, the communication path is established between the global server 13 and the local server 14.

In step 6, the client 50 requests the global server 13 to display the file of the volume. The global server 13 searches the local server in which the resource exists based on the name of the volume. When the correct local server is found, the global server 13 requests processing of the message by using the corresponding R-CAP.

In steps 7 and 8, when the global server 13 requests the local server 14 to process the message by using the corresponding R-CAP, and the local server 14 receives the message from the global server 13 and performs the processing of the request.

Figure 7 is a view for explaining a detailed method of establishing a communication path shown in Fig. 6. The same reference numbers as used in Fig. 6 are attached to the same components in this drawing. The mediator 11 has a control table 11a, and the global server 13 also has a control table 13a. The control table 11a includes the name of the server and the destination, and the control table 13a includes the name of the volume and the destination of the local server.

In step 1, when the global server (a) requests the registration of the C-CAP from the mediator 11, the mediator 11 registers the global server (a) (as the name of the server) and the capability C-CAP 1 of the destination in the control table 11a.

In step 2, the local server 14 informs the name of the server (global server (a)) to the mediator 11 when the local server wishes to acquire the C-CAP of the global server 13.

In step 3, the mediator 11 informs a destination (C-CAP) of the global server 13 to the local server 14 when the mediator 11 receives the request of the C-CAP from the local server 14.

In step 4, the local server 14 transmits a message to the global server 13. In this case, the message includes the R-CAP indicating its own destination, and the name of the volume (volume α) to be managed by itself. The global server 13 registers the name of the volume (volume α) and the corresponding des-

tination of the local server 14 in the control table 13a. The C-CAP 1 is used as the destination.

In step 5, when the client 50 wishes to process a volume, the client 50 informs the name of the volume (volume α) by using the C-CAP as the destination.

In step 6, when the global server 13 receives a processing request from the client, the global server 13 checks the control table 13a, and obtains the destination (R-CAP 1) of the local server 14 which manages the volume α. Further, the global server 13 informs the request of the client server 50 to the local server 14.

As explained above, the local server 14 receives the destination (C-CAP 1) of the global server 13 from the mediator 11, then requests the establishment of the communication path using the C-CAP 1 from the global server. Accordingly, it is possible to arbitrarily establish the communication path between the global server and the local server. Therefore, it is not necessary for the global server to hold the fixed definition data for the local server, and the global server can asynchronously receive the start-up of the local server so that it is possible to easily establish the communication path between the servers.

Figure 8 is a basic block diagram for explaining the second aspect of the present invention. The same reference numbers as used in Fig. 1 are attached to the same components in this drawing. Reference number 15 denotes a reception server. As a feature of this invention, only one reception server 15 is provided in the composite computer system 10 to receive requests to use the resource from the client server 50.

The reception server 50 is constituted by a management means 15a, volume name deriving means 15b, and destination data acquisition means 15c. The management means 15a manages the capability and the name of the volume transmitted from the global server 13. The volume name deriving means 15b derives the name of the volume in which the resource exists from the name of the resource designated by the client 50. The destination data acquisition means 15c acquires the corresponding capability by searching the management means 15a based on the name of the volume derived from the volume name deriving means 15b.

In step 1, the global server 13 informs the completion of the connection of the volume to the local server 14, 14', and requests an entry of the volume to the local server 14, 14' to provide an environment for handling the request from the client 50. The entry is defined as the establishment of the connection between servers.

In step 2, the local server 14 performs the entry of the volume in response to the request of the entry of the volume from the global server 13.

In step 3, when the entry of the volume is completed by the local server 14, the global server 14 transmits the capability indicating the destination of the volume entered therein.

In step 4, when the global server 13 receives the capability transmitted from the local server 14, the global server 13 transmits the capability and the name of the volume to the reception server 15.

The management means 15a of the reception server 15 manages the capability and the name of the volume transmitted from the global server 13. When the reception server 15 receives the request to use the resource from the client 50, the volume name deriving means 15c derives the name of the volume in which the resource exists from the name of the resource indicated by the client. Further, the destination data acquisition means 15b acquires the capability of the requested volume by searching the management means 15a based on the name of the volume derived from the volume name deriving means 15c. Accordingly, the reception server 15 issues the request to use the volume to the local server 14 by using the capability as the destination. In the present invention, it is possible for the reception server to immediately specify the local server which manages the volume requested from the client without sending any inquiry to the global and local servers.

Figure 9 is a view for explaining an operation of the communication according to the second aspect of the present invention.

In Fig. 9, the same reference numbers as used in Fig. 8 are attached to the same components in this drawing. First, the global server 13 performs the processing to establish the communication path between the global server 13 and the local server 1, and between the global server and the reception server 15.

As explained in the first aspect of the present invention, the establishment of the communication path is performed in such a way that, after the initialization of the global server 13 itself is completed, the global server 13 registers the C-CAP in the mediator 11 (see, Fig. 1), the local server 14 acquires the C-CAP of the global server 13 from the mediator 11 after initialization is completed, and the local server 14 transmits the R-CAP to the global server 13 by using the C-CAP as the destination.

In the second aspect of the present invention, the establishment of the communication path between the global server 13 and the reception server 15 is performed based on the following steps. First, after the initialization of the reception server 15 itself is completed, the reception server 15 registers the C-CAP in the mediator 11. After the initialization of the global server 13 is completed, the global server 13 acquires the C-CAP of the reception server 15, and transmits its own C-CAP to the reception server 15 by using the acquired C-CAP as the destination. Further, the establishment of the communication path between the client 50 and the reception server 15 is performed by using the C-CAP of the reception server 15 registered in the mediator 11.

The processing steps shown in Fig. 9 are explained in detail hereinafter.

In step 1, the global server 13 informs the completion of the connection to local server 14 which requested the processing. The information is performed for the volume at which the connection is completed. Further, the global server 13 requests the entry of the volume to the local server 14 to prepare the environment for handling the request from the client 50. In this case, the message communication from the global server 13 to the local server 15 is performed by using the R-CAP of the local server 14 as the destination.

In step 2, when the local server 14 receives the request of the entry of the volume from the global server 13, the local server 14 performs the entry of the volume to prepare the environment for using the requested volume. Further, the local server 14 issues the R-CAP using as the destination of the volume to the global server 13.

In step 3, when the global server 13 receives the R-CAP of the volume from the local server 14, the global server 13 informs the received R-CAP and the name of the volume to the reception server 15.

In step 4, when the reception server 15 receives the R-CAP and the name of the volume from the global server 13, the reception server 15 registers the R-CAP and the name of the volume in a R-CAP management table 30 (see, Fig. 10).

In step 5, after the communication path between the client 50 and the reception server 15 is established, the client 50 issues the request to use the resource to the reception server 15 by using the C-CAP of the reception server 15 as the destination.

In step 6, when the reception server 15 receives the request to use the resource, the reception server 15 acquires the volume in which the resource exists based on the designated resource name by using a name solution means (not shown).

In step 7, when the reception server 15 acquires the name of the volume, the reception server 15 searches the R-CAP management table 30. In this case, the acquired volume name is used as a keyword for the search. The reception server 15 acquires the R-CAP of the volume corresponding to the volume name.

In step 8, when the reception server 15 acquires the R-CAP of the volume, the reception server issues the request to use the volume to the local server 14 which manages the resource requested from the client 50 by using the acquired R-CAP of the volume as the destination.

In step 9, when the local server 14 receives the request to use the resource, the local server 14 starts to use the volume.

As explained above, since the reception server 15 manages the R-CAP of the volume which the local server manages, the reception server 15 can specify the local server 14 managing the requested volume without sending an inquiry to the global and local servers.

Figure 10 is a view for explaining a R-CAP management table in the reception server according to the second aspect of the present invention. This R-CAP management table is used for the registration of the R-CAP in the reception server 15 explained in step 4 of Fig. 9. In Fig. 10, the reception server 15 has a basic control table 31, and a plurality of R-CAP management tables 30. The basic control table 31 is pointed from a fixed area at a space, and used as an anchor point. The R-CAP management tables 30 are interconnected to each other in the form of a chain. Each R-CAP management table 30 manages an R-CAP and the name of a volume. In this case, the R-CAP and the name of the volume are indicated by the volume transmitted from the global server 13.

Figure 11 is a flowchart for explaining the registration in the R-CAP management table shown in Fig. 10. This flowchart explains in detail the registration process in the step 4 of Fig. 9.

When the management means 15a in the reception server 15 receives the message of the R-CAP from the global server 13 (step 1), the management means 15a exclusively acquires the chain of the R-CAP management table 30 (step 2). Next, the management means 15a searches the R-CAP management table 30 to find the same volume name as the received volume name. That is, the management means 15a defines a head address of the chain as a parameter P (step 3) to find the same volume name as the received volume name, and judges whether or not the parameter P indicates a NULL point (step 4), and when the parameter P is not a NULL point (NO), the management means 15a judges whether or not the volume name of the R-CAP management table is the same volume name as the received volume name (step 5). When the volume name is the same as the received volume name (YES), a new R-CAP replaces the previous R-CAP of the volume in the R-CAP management table 30 (step 6). Further, the management means 15a releases the exclusive control of the chain of the R-CAP management table 30.

In step 4, when the parameter P is a NULL point (YES), the management means 15a prepares a new R-CAP management table (step 9). Further, in step 5, when the volume name of the R-CAP management table is not the same as the received volume name (NO), the parameter P is updated to a new address (step 8).

Figure 12 is a flowchart for explaining the search step in the R-CAP management table shown in Fig. 10. These steps explain in detail the search process at steps 5, 6, and 7 of Fig. 9. When the reception server 15 receives the request to use the resource from the client (step 1), the management means 15a in the

reception server 15 acquires the volume name based on the resource name from the client 50 (step 2), and the management means 15b exclusively acquires the chain of the R-CAP management table 30 (step 3). Next, the management means 15a searches the R-CAP management table 30 to find the same volume name as the received volume name. That is, the management means 15a defines a head address of the chain as a parameter P (step 4) to find the same volume name as the received volume name, and judges whether or not the parameter P indicates a NULL point (step 5), and when the parameter P is not a NULL point (NO), the management means 15a judges whether or not the volume name of the R-CAP management table is the same volume name as the received volume name (step 6). When the volume name is the same as the received volume name (YES), the management means 15b exclusively performs the acquisition of the corresponding R-CAP management table (step 7). Further, the management means 15a releases the exclusive control of the chain of the R-CAP management table 30.

In step 5, when the parameter P is a NULL point (YES), the management means 15a informs the message which the volume can not use (step 10). Further, in step 6, when the volume name of the R-CAP management table does not correspond to the received volume name (NO), the parameter P is updated to a new address (step 9).

## Claims

1. A system for establishing a communication path between one global server and a plurality of local servers and transmitting a request for processing a message through the communication path in a closely coupled computer system, the establishing system comprising;

   a first capability (C-CAP) which is issued from the global server (13) or the local server (14, 14') to an arbitrary client to receive a request transmitted from the arbitrary client;

   a second capability (R-CAP) which is issued from the global server or local server to a specified server to establish a communication path ensuring security of a message from the specified server;

   message communication means (12) for transmitting the message between the global server and the local server by using the first and second capability; and

   destination intermediation means (11) for registering the first capability and informing the first capability to the local server to intermediate the communication between the global server and the local server;

   wherein the global server requests the registration of the first capability from the destination intermediation means, the local server acquires the first capability from the destination intermediation means, and the local server requests the establishment of the communication path from the local server to the global server by using the second capability.

2. A system for establishing a communication path as claimed in claim 1, further comprising a reception server (15) for receiving a request from a client (50) which wishes to use a resource, the global server (13) transmitting a capability to the reception server, and the capability indicating the destination of a volume file transmitted from the local server and corresponding to the volume file.

3. A system for establishing a communication path as claimed in claim 2, wherein the reception server comprises management means (15a) for managing the name of the volume and the capability transmitted from the global server, volume name deriving means (15b) for deriving the corresponding volume name from the resource indicated by the client, and destination data acquisition means for acquiring the corresponding capability by searching the management means based on the volume name derived from the volume name deriving means.

4. A system for establishing a communication path as claimed in any preceding claim, wherein said destination intermediation means (11) comprises a control table (11a) constituted by the name of the server and the destination of the server.

5. A system for establishing a communication path as claimed in any preceding claim, wherein said global server (13) comprises a control table constituted by the name of the server and the destination of the local server.

6. A system for establishing a communication path as claimed in any one of claims 2 to 5, wherein said reception server further comprises a plurality of R-CAP management tables for managing the volume name and the capability.

Fig. 1

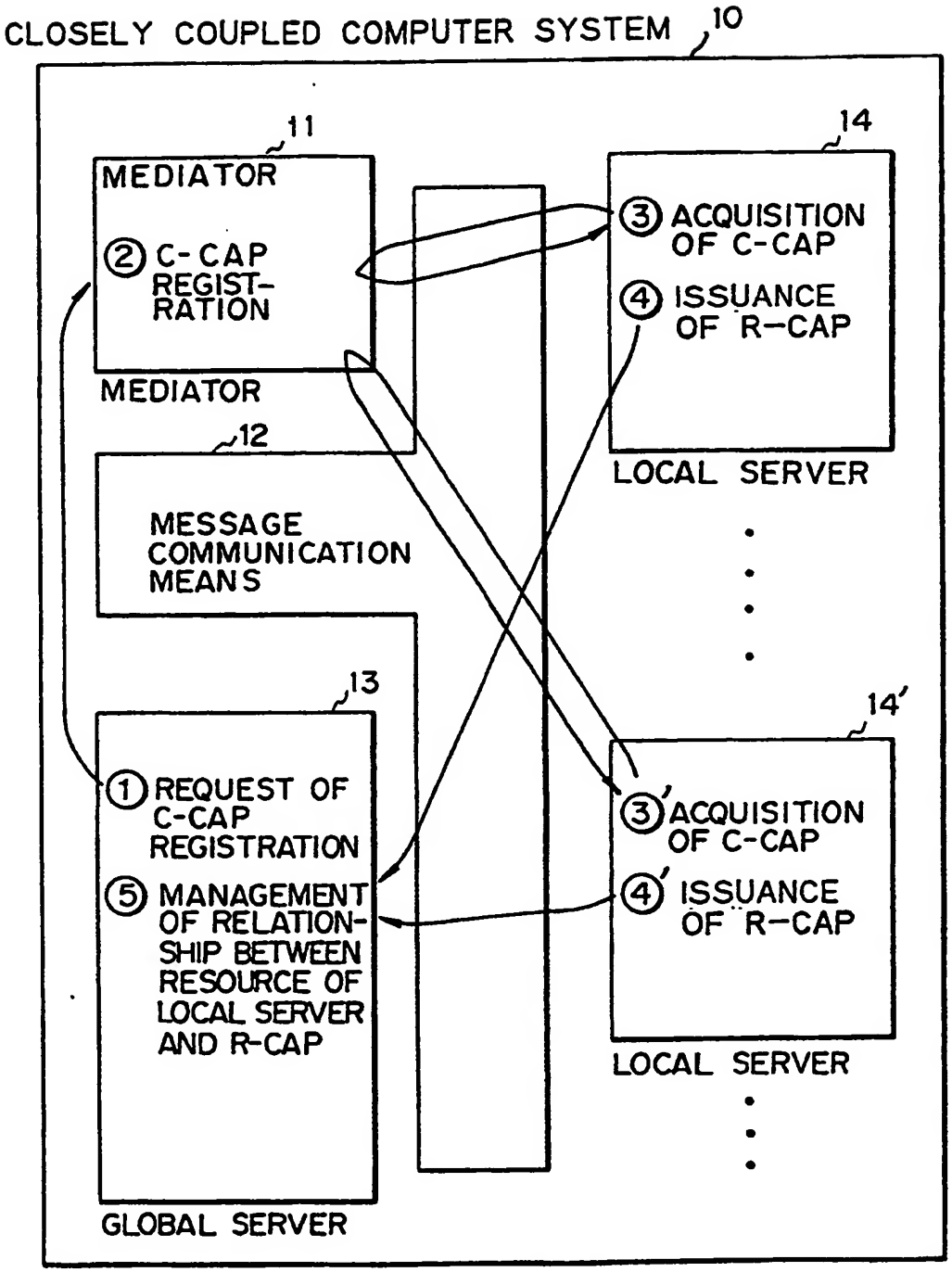

CLOSELY COUPLED COMPUTER SYSTEM
10
11
MEDIATOR
② C-CAP REGIST-RATION
MEDIATOR
12
MESSAGE COMMUNICATION MEANS
13
① REQUEST OF C-CAP REGISTRATION
⑤ MANAGEMENT OF RELATION-SHIP BETWEEN RESOURCE OF LOCAL SERVER AND R-CAP
GLOBAL SERVER
14
③ ACQUISITION OF C-CAP
④ ISSUANCE OF R-CAP
LOCAL SERVER
14'
③' ACQUISITION OF C-CAP
④' ISSUANCE OF R-CAP
LOCAL SERVER

Fig. 2

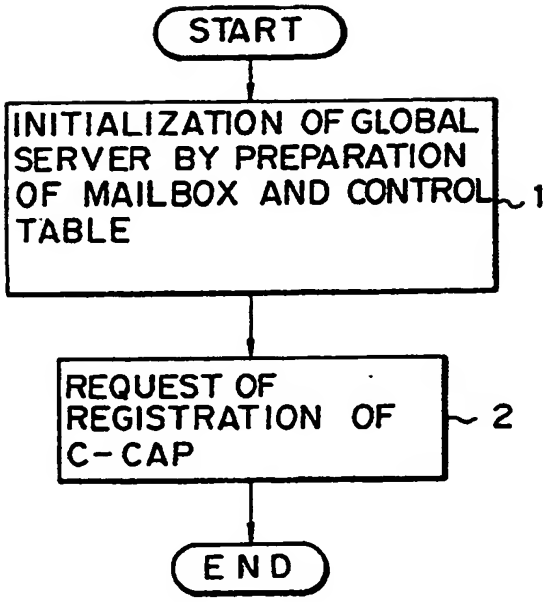

START
INITIALIZATION OF GLOBAL SERVER BY PREPARATION OF MAILBOX AND CONTROL TABLE
1
REQUEST OF REGISTRATION OF C-CAP
2
END

Fig. 3

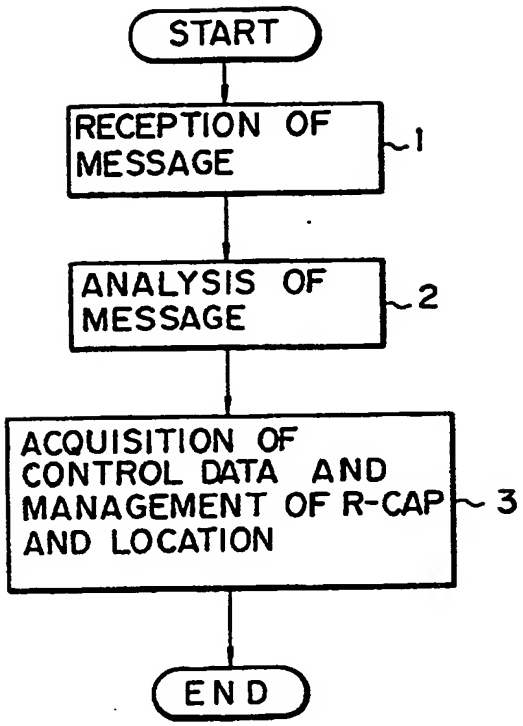

START
RECEPTION OF MESSAGE
1
ANALYSIS OF MESSAGE
2
ACQUISITION OF CONTROL DATA AND MANAGEMENT OF R-CAP AND LOCATION
3
END

Fig. 4

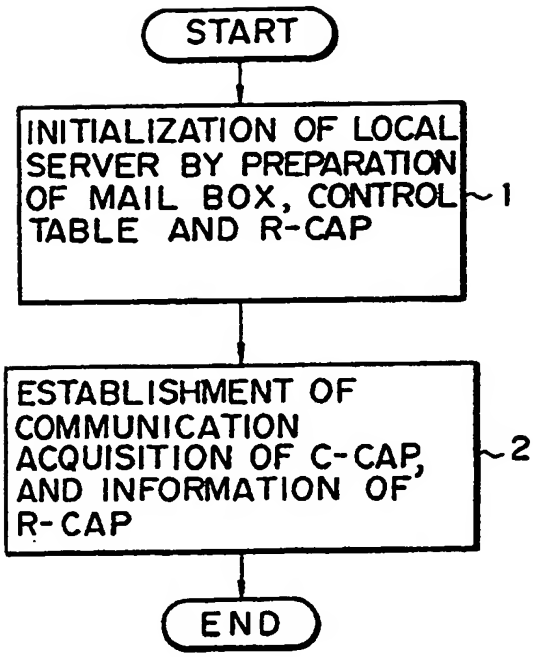

START
INITIALIZATION OF LOCAL SERVER BY PREPARATION OF MAIL BOX, CONTROL TABLE AND R-CAP
1
ESTABLISHMENT OF COMMUNICATION ACQUISITION OF C-CAP, AND INFORMATION OF R-CAP
2
END

Fig. 5

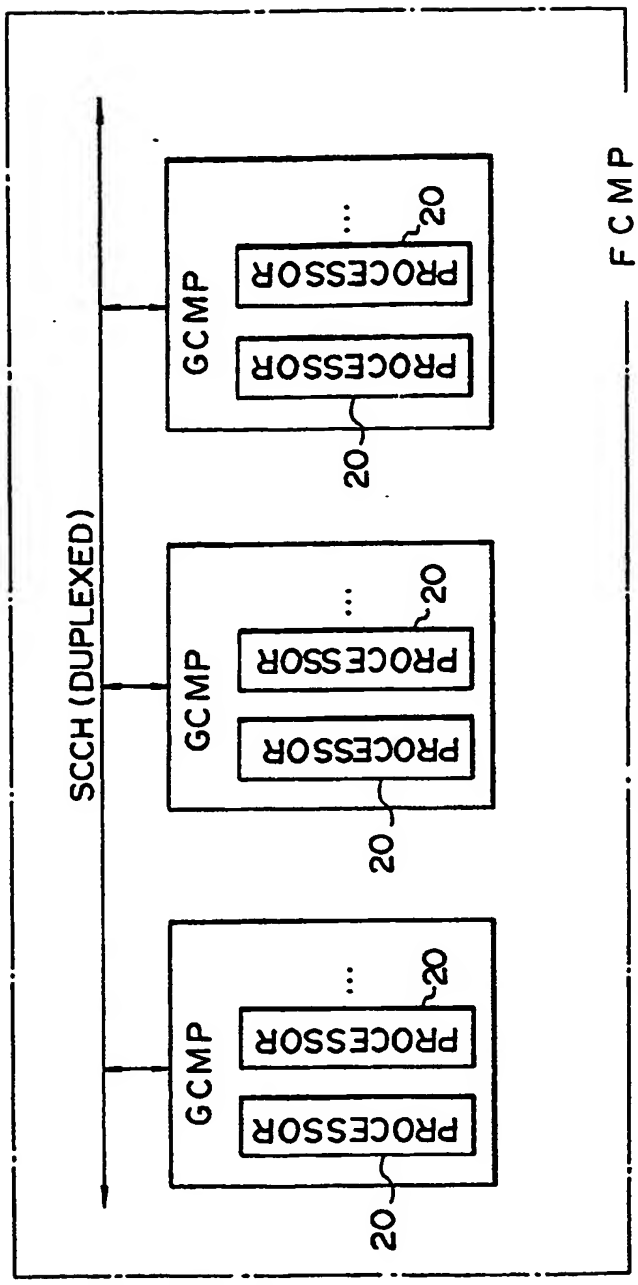

FCMP
SCCH (DUPLEXED)
GCMP
PROCESSOR
20
FCMP (FLEXIBLY COUPLED MULTI PROCESSOR)
GCMP (GLOBAL COUPLED MULTI PROCESSOR)
SCCH (SYSTEM COMMUNICATION CHANNEL)

Fig. 6

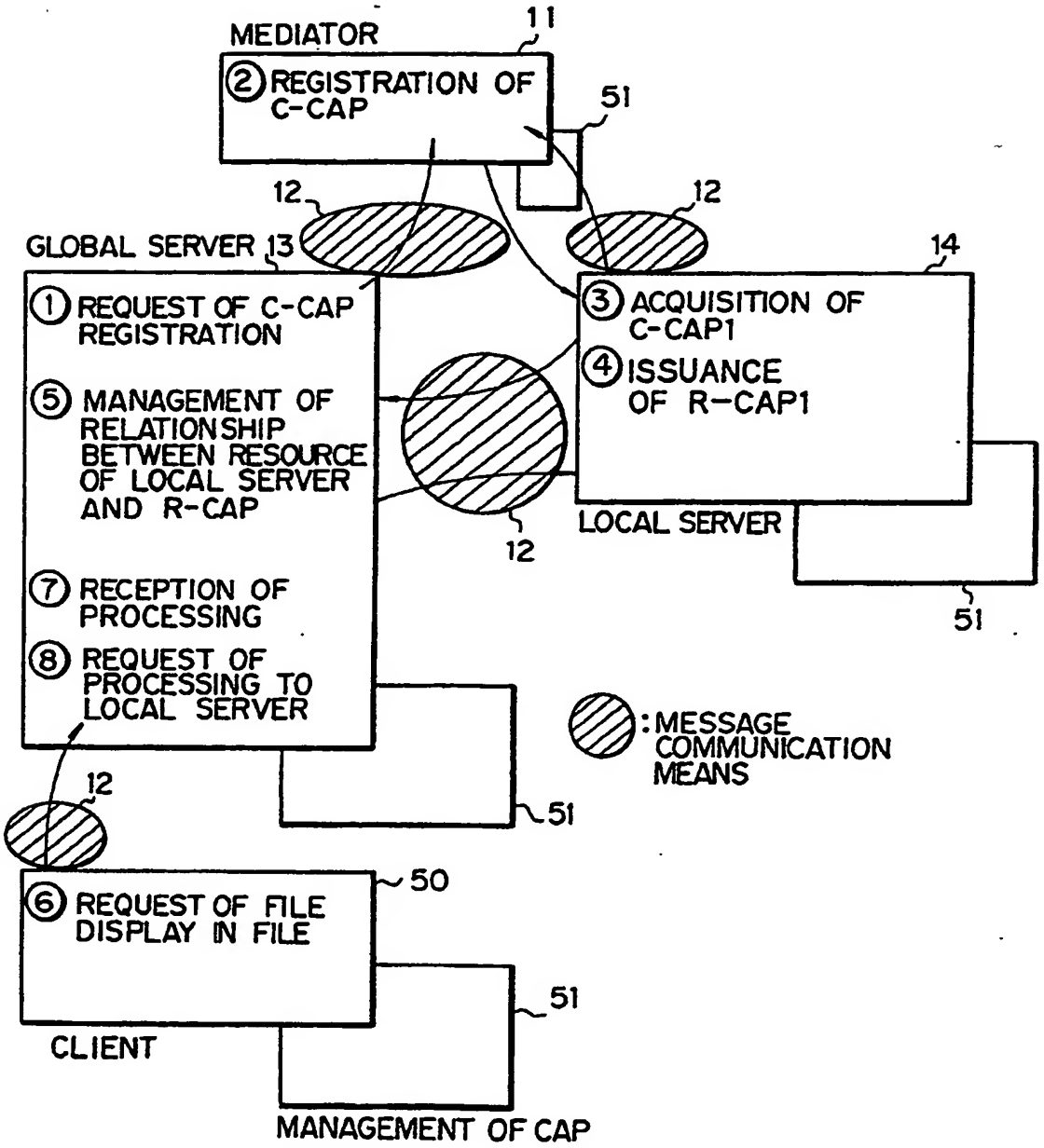

MEDIATOR
11
② REGISTRATION OF C-CAP
51
12
12
GLOBAL SERVER 13
14
① REQUEST OF C-CAP REGISTRATION
③ ACQUISITION OF C-CAP1
④ ISSUANCE OF R-CAP1
⑤ MANAGEMENT OF RELATIONSHIP BETWEEN RESOURCE OF LOCAL SERVER AND R-CAP
12
LOCAL SERVER
51
⑦ RECEPTION OF PROCESSING
⑧ REQUEST OF PROCESSING TO LOCAL SERVER
: MESSAGE COMMUNICATION MEANS
51
12
50
⑥ REQUEST OF FILE DISPLAY IN FILE
51
CLIENT
MANAGEMENT OF CAP

Fig. 7

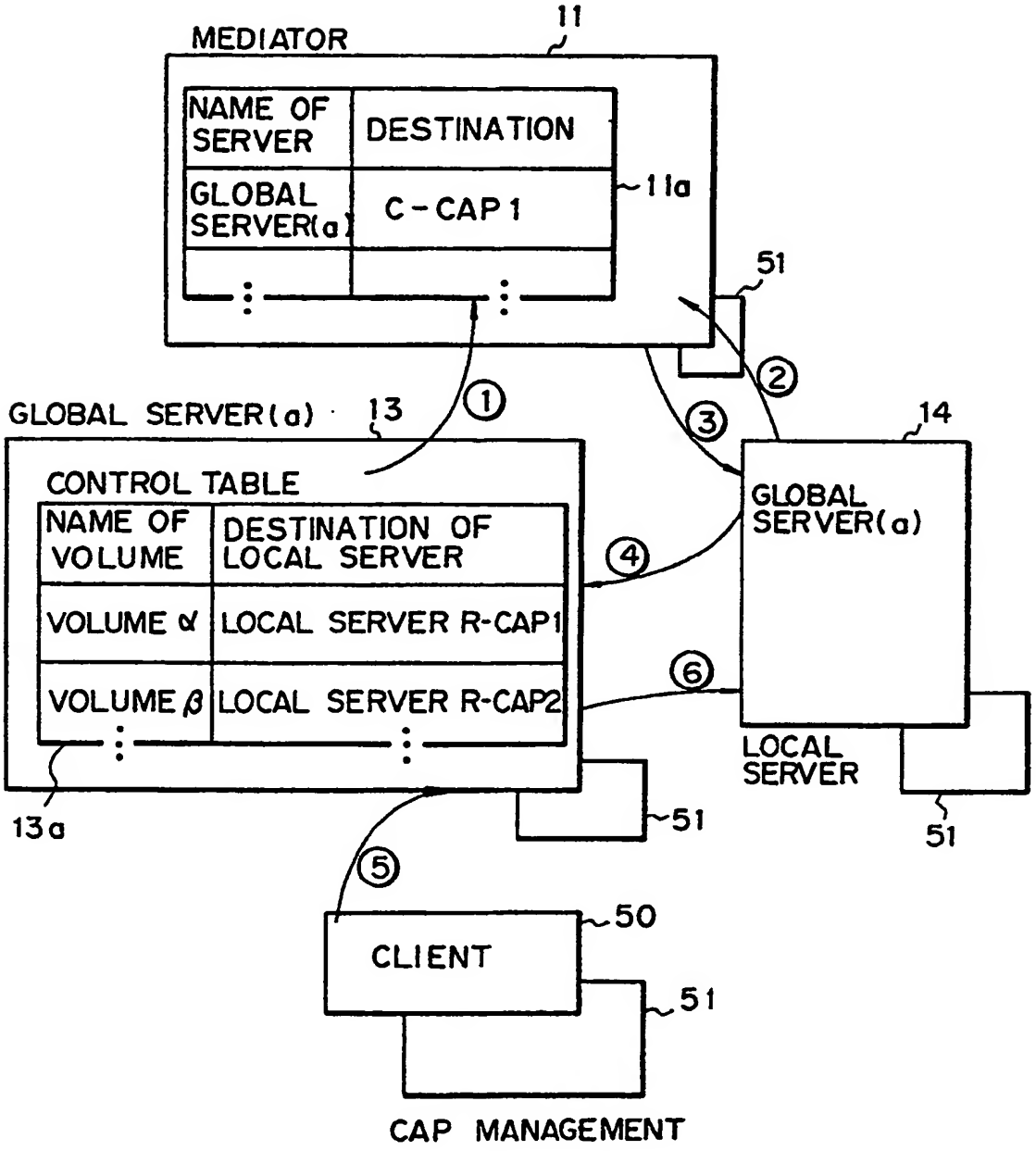

MEDIATOR
11
NAME OF SERVER
DESTINATION
GLOBAL SERVER(α)
C-CAP 1
11a
51
GLOBAL SERVER(α)
13
CONTROL TABLE
NAME OF VOLUME
DESTINATION OF LOCAL SERVER
VOLUME α
LOCAL SERVER R-CAP1
VOLUME β
LOCAL SERVER R-CAP2
13a
14
GLOBAL SERVER(α)
LOCAL SERVER
51
51
①
②
③
④
⑤
⑥
50
CLIENT
51
CAP MANAGEMENT

Fig. 8

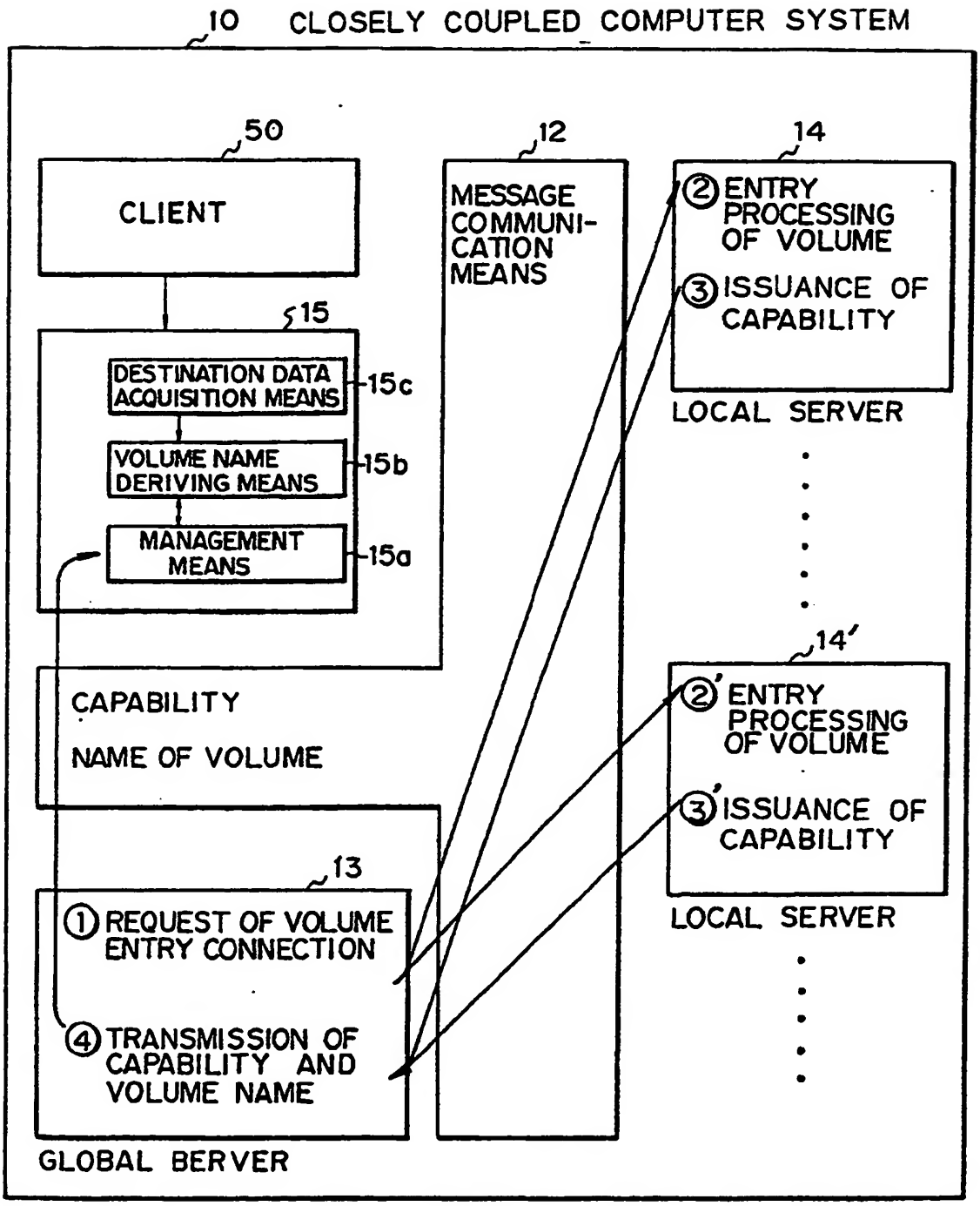

10 CLOSELY COUPLED COMPUTER SYSTEM
50
CLIENT
15
DESTINATION DATA ACQUISITION MEANS
15c
VOLUME NAME DERIVING MEANS
15b
MANAGEMENT MEANS
15a
12
MESSAGE COMMUNI-CATION MEANS
14
② ENTRY PROCESSING OF VOLUME
③ ISSUANCE OF CAPABILITY
LOCAL SERVER
14'
②' ENTRY PROCESSING OF VOLUME
③' ISSUANCE OF CAPABILITY
LOCAL SERVER
CAPABILITY
NAME OF VOLUME
13
① REQUEST OF VOLUME ENTRY CONNECTION
④ TRANSMISSION OF CAPABILITY AND VOLUME NAME
GLOBAL BERVER

Fig. 9

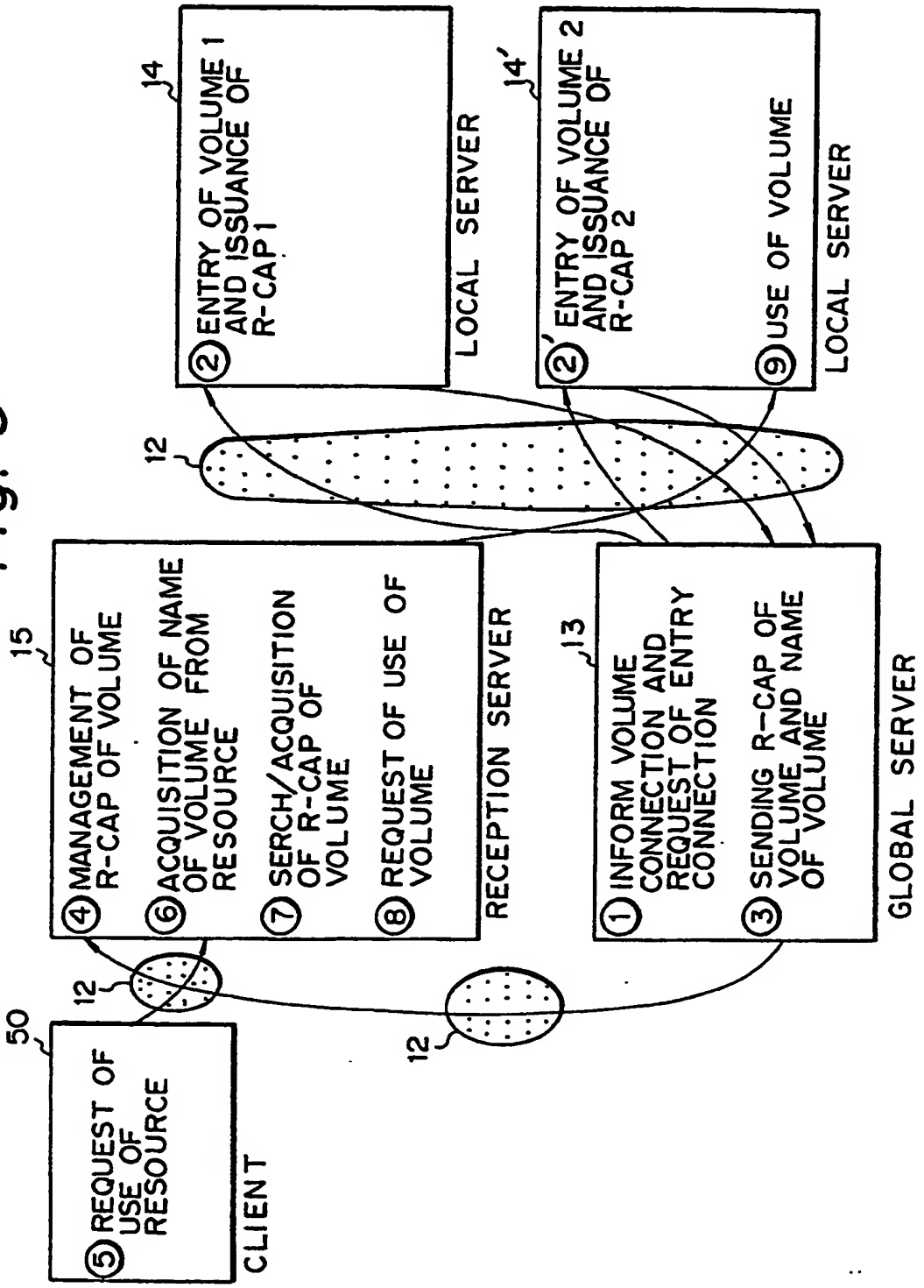

14
② ENTRY OF VOLUME 1 AND ISSUANCE OF R-CAP 1
LOCAL SERVER
14'
②' ENTRY OF VOLUME 2 AND ISSUANCE OF R-CAP 2
⑨ USE OF VOLUME
LOCAL SERVER
12
15
④ MANAGEMENT OF R-CAP OF VOLUME
⑥ ACQUISITION OF NAME OF VOLUME FROM RESOURCE
⑦ SERCH/ACQUISITION OF R-CAP OF VOLUME
⑧ REQUEST OF USE OF VOLUME
RECEPTION SERVER
13
① INFORM VOLUME CONNECTION AND REQUEST OF ENTRY CONNECTION
③ SENDING R-CAP OF VOLUME AND NAME OF VOLUME
GLOBAL SERVER
12
50
⑤ REQUEST OF USE OF RESOURCE
CLIENT
12

Fig. 10

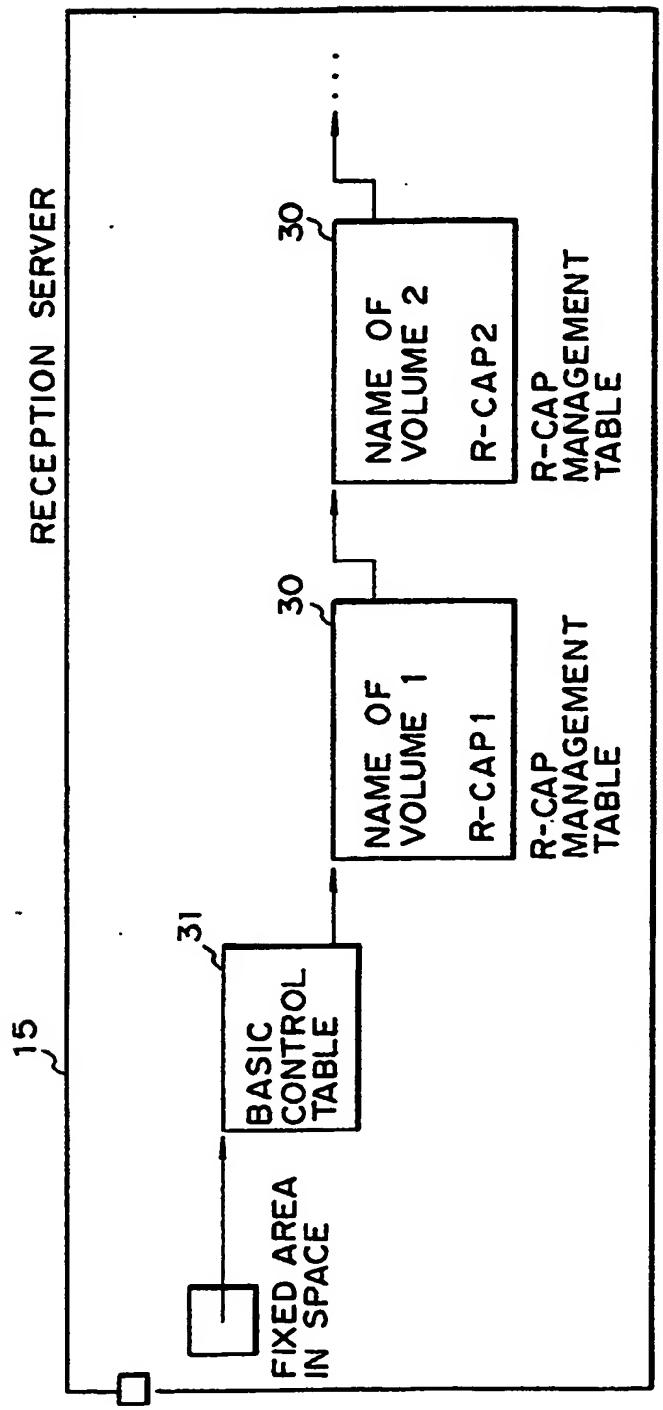

RECEPTION SERVER
15
31
BASIC CONTROL TABLE
FIXED AREA IN SPACE
30
NAME OF VOLUME 1
R-CAP1
R-CAP MANAGEMENT TABLE
30
NAME OF VOLUME 2
R-CAP2
R-CAP MANAGEMENT TABLE

Fig. 11

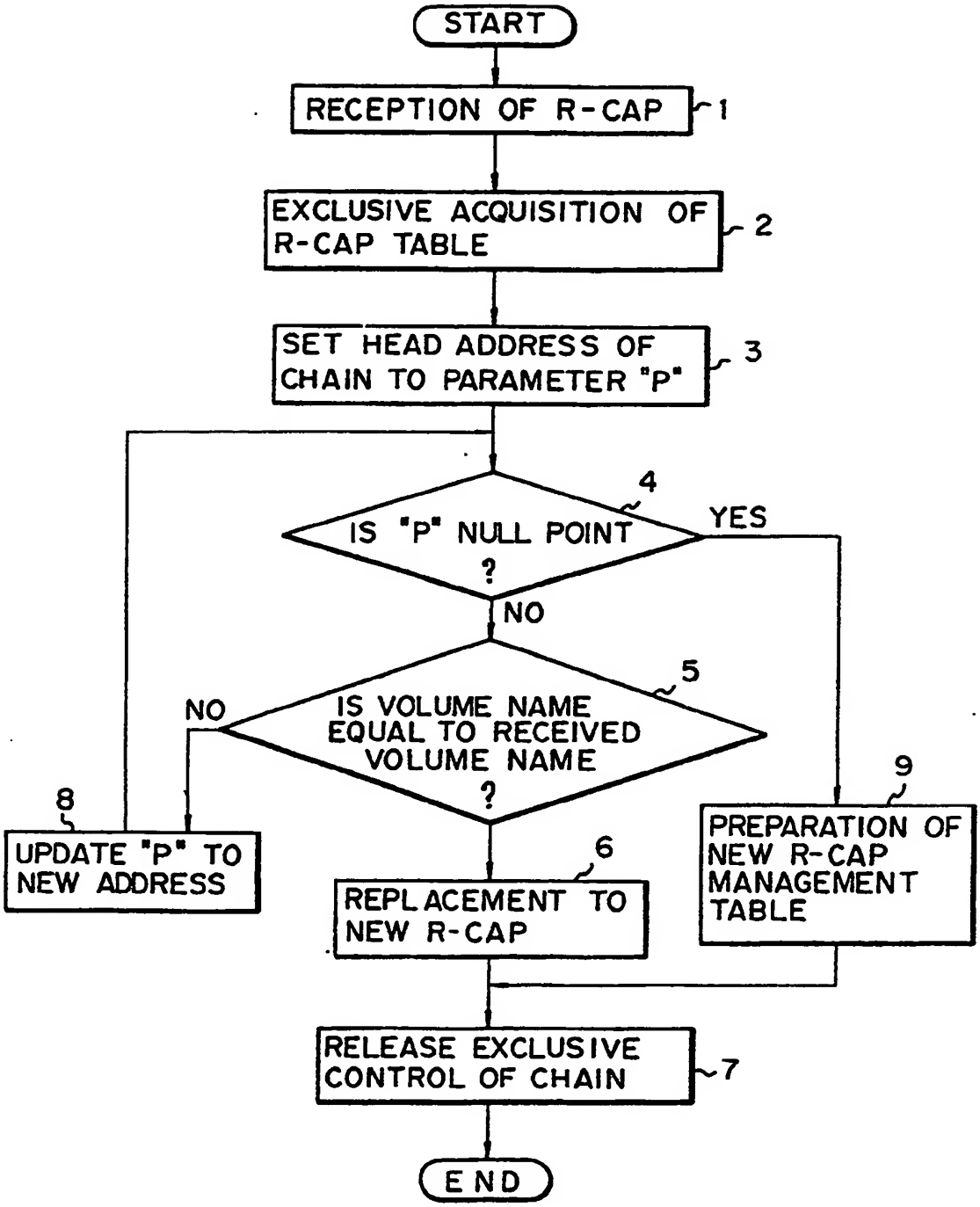
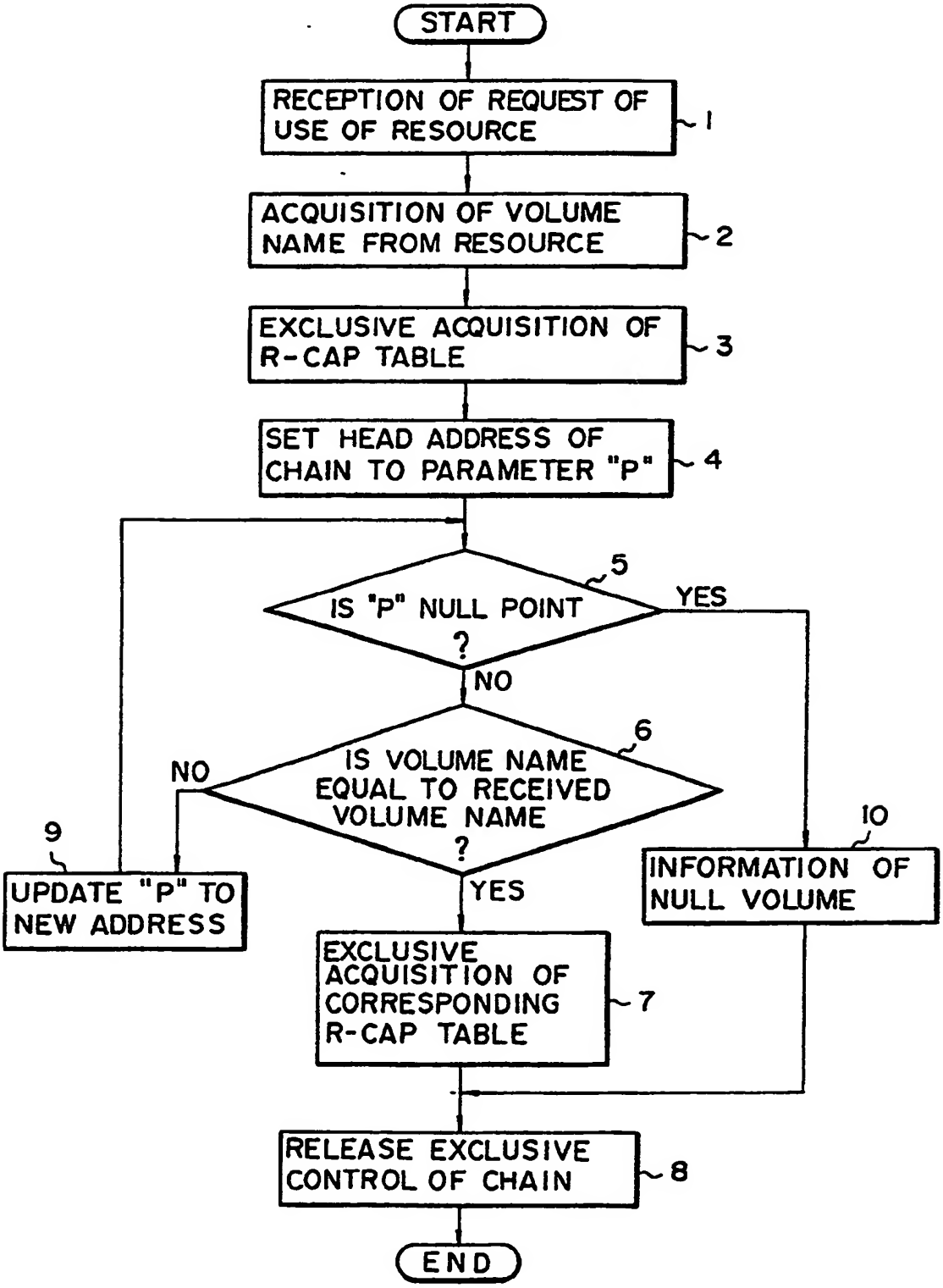

START
RECEPTION OF R-CAP
1
EXCLUSIVE ACQUISITION OF R-CAP TABLE
2
SET HEAD ADDRESS OF CHAIN TO PARAMETER "P"
3
4
IS "P" NULL POINT ?
YES
NO
5
IS VOLUME NAME EQUAL TO RECEIVED VOLUME NAME ?
NO
8
UPDATE "P" TO NEW ADDRESS
6
REPLACEMENT TO NEW R-CAP
9
PREPARATION OF NEW R-CAP MANAGEMENT TABLE
RELEASE EXCLUSIVE CONTROL OF CHAIN
7
END

Fig. 12


START
RECEPTION OF REQUEST OF USE OF RESOURCE
1
ACQUISITION OF VOLUME NAME FROM RESOURCE
2
EXCLUSIVE ACQUISITION OF R-CAP TABLE
3
SET HEAD ADDRESS OF CHAIN TO PARAMETER "P"
4
5
IS "P" NULL POINT ?
YES
NO
6
IS VOLUME NAME EQUAL TO RECEIVED VOLUME NAME ?
NO
YES
9
UPDATE "P" TO NEW ADDRESS
10
INFORMATION OF NULL VOLUME
EXCLUSIVE ACQUISITION OF CORRESPONDING R-CAP TABLE
7
RELEASE EXCLUSIVE CONTROL OF CHAIN
8
END